

United States Marine Corps
Command and Staff College
Marine Corps University
2076 South Street
Marine Corps Combat Development Command
Quantico, Virginia 22134-5068

Master of Military Studies

TITLE:

PROPOSALS FOR THE FUTURE OF JCAS DOCTRINE

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF
MILITARY STUDIES

AUTHOR:

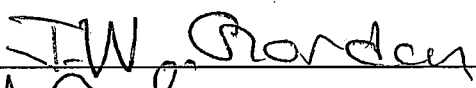
MAJOR LUIS E. VILLALOBOS, USMC

AY 07-08

Mentor and Oral Defense Committee Member: **Dr. Wray R. Johnson, Ph.D.**

Approved: 

Date: 9 Apr 2008

Oral Defense Committee Member: 

Approved: 

Date: 9 Apr 08

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE 2008		2. REPORT TYPE		3. DATES COVERED 00-00-2008 to 00-00-2008	
4. TITLE AND SUBTITLE Proposals for the Future of JCAS Doctrine				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) United States Marine Corps,Command and Staff College, Marine Corps Combat Development Command,Marine Corps University 2076 South Street,Quantico,VA,22134-5068				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 32	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Disclaimer

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

QUOTATION FROM, ABSTRACTION FROM, OR REPRODUCTION OF ALL OR ANY PART OF THIS DOCUMENT IS PERMITTED PROVIDED PROPER ACKNOWLEDGEMENT IS MADE

Table of Contents

	<i>Page</i>
Disclaimer	i
Executive Summary	1
Introduction	2
History of Close Air Support	3
Current Views on JCAS	15
JCAS Doctrine	20
Conclusion	22
Bibliography	27

Executive Summary

Title: Proposals for the Future of JCAS Doctrine

Author: Major Luis E. Villalobos, United States Marine Corps

Thesis: JCAS doctrine must continue to be refined. An over-reliance on technology in an evolving Joint Close Air Support (JCAS) dogma increases airpower's risk of fratricide to friendly forces in conflicts of the future.

Discussion: Ever since the introduction of the airplane for use in military operations, the issue of its employment in the Close Air Support mission has been a contentious issue within the armed services of the United States. Service culture has played a major role in dictating strategic stances within DoD on what aviation roles and missions will pertain to each service. These arguments have divided the services over the use of airpower and have resulted in significant clashes throughout history. Using a historical overview of Close Air Support from World War I through Operation Desert Storm, examples of negative ramifications of these arguments can be seen at the tactical level. Leading into the 21st century, the Goldwater-Nichols Act of 1986 emphasized the need to look at CAS from a Joint perspective. Furthermore, technological advances led to more simplified methods of executing CAS and have continued to modernize the battlefield. A Joint doctrine was drafted to accommodate these advances and it allowed more flexible use of airpower just prior to Operations Enduring / Iraqi Freedom. The original draft of the JCAS publication was not complete, however, and provided vague direction in controlling and executing Close Air Support. Rather than agreeing to employ more "restrictive" doctrinal measures with regards to procedures, qualifications, and extensive training requirements across all services, some professionals within the Department of Defense prefer to invest in developing technologically advanced systems to bridge the gap made by its complex nature. The issue remains that there will always be holes that technology cannot fill. Attempting to oversimplify this complex mission will hamper the safe and effective use of CAS. We must therefore adopt a JCAS doctrine that provides detailed provisions and is yet flexible enough to adapt to future changes in technology providing ground commanders the needed airpower from any asset within DoD.

Conclusion: Troop losses in future conflicts due to fratricide could be reduced significantly by developing a JCAS doctrine that is complete, and more importantly, that is fully agreed to by all services. It is time to cease arguing over age-old issues of culture originating from before the Korean War and get on with the next era of Joint Close Air Support.

Introduction

Throughout the long history of warfare, there has not been a single greater impact on shaping the character of war than the advent of the airplane in the early 1900s. The battlefield was modernized with the airplane's unique capabilities. Enemy positions were made more vulnerable as opportunities were developed to implement the airplane as a source of firepower on the front lines of ground forces, or loosely termed close air support. Advocates of airpower argued the efficient use the airplane in this manner over using it to strike targets deep inside enemy territory. This argument has been ongoing over the past one hundred years and even continues today between elements of the U.S. armed services. Close Air Support (CAS) is seen as a tactical mission. It has been a contentious issue between the armed services stemming from service culture. Arguments about roles and missions have existed since the mid 1940s and have driven initiatives to develop and acquire new service-centric platforms. In many cases, however, it is uncertain whether the cart came before the horse in how some platforms were envisioned and acquired. Regardless, the negative ramifications of these arguments were imparted at the tactical level and can be traced through a historical view of CAS from World War I through Operation Desert Storm.

Additionally, over the past twenty years, drives toward technological advancements in aviation and ground systems have modernized the battlefield even further. While they provided simplified methods for executing CAS, they did not eliminate all of its complexities. Disputes continued over definitions, requirements to control CAS, roles, and missions. With the inception of the Goldwater-Nichols Act of 1986, the services within the Department of Defense (DoD) were forced to integrate and work together toward a "Joint" vision. A Joint CAS (JCAS)

doctrine was initially drafted prior to Operation Iraqi Freedom (OIF) in 2003, but service-culture related arguments surfaced again.

For the scope of this paper, *service culture* will be defined as the roots of parochial philosophies, anchored by American military institutional personalities within the U.S. Army, Navy, Air Force, and Marine Corps, embedded into military strategy and conceptual thinking.¹ These roots are described as being so deep that, “though many people outside the military institution, including academics and presidents, may propose military strategies and concepts, these can be implemented only if and when military institutions accept and pursue them.”²

The current JCAS publication is not even labeled as doctrine but simply a Tactics, Techniques and Procedures (JTTP) manual. Qualification criteria and execution procedures must be explicitly applied across all services in the form of doctrine and the JCAS doctrine must continue to be refined. It should be detailed and yet capable of adapting to advances in technology, standardized in qualification measures, and binding in some areas that require extensive training proficiency and execution guidelines. An over-reliance on technology in an evolving Joint Close Air Support (JCAS) dogma increases airpower’s risk of fratricide to friendly forces in conflicts of the future.

History of Close Air Support

World War I

The invention of the airplane brought about several aviation masterminds that would influence perspectives on the future use of airpower. While the U.S. was looking for ways to implement the airplane into military operations, escalations toward war were apparent in Europe. The ensuing progress of airpower was primarily seen on the Western Front between British and German efforts. After the battle of Somme, the British continued to develop their ground-attack

methods. In May 1917, The Royal Flying Corps (RFC) used a combination of 20lb bombs and machine gun fire to attack German troops in front of British lines in a technique called "trench strafing", or *strafen* in German, translated as "punishment."³ This was, in modern terms, close air support as their "efforts to use aircraft in direct support of advancing troops marked the first steps toward a British ground-attack doctrine."⁴ The American Army pilots under Colonel William Mitchell followed in 1918 and adapted these British tactics. At this point in his career, Mitchell was "an enthusiast for close-air support tactics."⁵ The Germans mirrored a similar ground-attack plan and developed a two-seat aircraft with an improved engine and a larger payload capacity. They adapted rather quickly to new methods of employment by applying better technological developments to newly produced aircraft. The attack techniques employed at the time required pilots to fly at low altitudes in order to properly aim and release their bombs accurately. As a result, casualty rates were extraordinarily high, nearly 35%.⁶ Captain Alfred A. Cunningham and his recently formed Aviation Company of U.S. Marine pilots arrived in France to fly along with the British in 1918. Many lessons were learned and later applied by the Marines as a result of experiences supporting the Western Front.

Interwar period 1919-1939

*The only excuse for aviation in any service is its usefulness in assisting the troops on the ground to successfully carry out their operations.*⁷

A.A. Cunningham, 1919

Weapon accuracy from close air support was sporadic and unpredictable during World War I, forcing pilots to fly at lower altitudes. Techniques to improve accuracy were developed and, thus, dive-bombing techniques were born. While many historians argue over the origins of dive-bombing, "the consensus has been that it was the United States Marine Corps aviators in central and south America (that) first brought this technique into a fine art."⁸ Lieutenant Lawson

H. M. Sanderson pioneered this method using a mail-sack technique at a 45 ° dive.⁹ Because of physics related to bomb-fall ballistics, pilots practiced techniques of steep angle bombing between 20 ° and 60 ° where true dive-bombing involved flight path angles in excess of 60° flight path angle to increase accuracy.¹⁰ If they could see the target in a dive, they could simply allow the current aircraft vector in a steep dive, aided by gravity, to complete the release and impact the target. Precision Guided Munitions (PGM's) would not be developed for decades; therefore, dive-bombing methods were needed in CAS for increased accuracy and were honed to a science.

The U.S. Marines were the only U.S. service with (aviation) combat experience in this interwar period in various "banana republics." They not only perfected techniques of working with ground forces, but also confirmed the purpose for aviation was "to substitute for a lack of comprehensive organic artillery, or to substitute for an absence of naval gunfire support."¹¹ This role would continue to be fortified for the Marine Corps well into World War II. For example, Major Ross Rowell, along with five DH-4s, executed close air support in a coordinated attack at Ocotal, Nicaragua, in 1927 to save 37 Marines from nearly 800 rebels that had isolated them.¹² The mission was a tremendous success with some 200 casualties and 80 dead.¹³

Successes in close air support were realized in Nicaragua due to a persistent philosophy concerning the employment airpower, extensive training, and establishing relevancy concerning "the newest" developments in the U.S. for technological advances in aviation. The philosophy, as stated by A.A. Cunningham, was aviation in support of ground troops. There was an apparent need for continued *integration* with ground forces and coordinated "prebriefed" attacks since air to ground communication was limited.¹⁴ Dive-bombing techniques were now coordinated amongst several aircraft, and the need to distinguish friend from foe also required ample amounts of training for the pilots. Finally, efforts back in the U.S. were bent on improving the

effectiveness of bombing. This included aircraft with stronger wings and airframes to withstand G-loading from pulling out from bombing dives. Aircraft were also being developed with much better engines, increasing their top speeds and range. Ordnance handling and capacities were also improved on aircraft allowing them to carry 500lb bombs.¹⁵

Even though close air support and the attack role of aircraft in “banana republics” demonstrated great success, it was far from the majority focus across the globe and in the United States. While the Navy and Marine Corps continued to refine dive-bombing, a notion for strategic air warfare was growing from Italian Giulio Douhet and followed up by General William Mitchell in the U.S. Army Air Corps (USAAC).¹⁶ This philosophy envisioned large, multi-engine bomber platforms capable of carrying several bombs and delivering attacks deep into the “enemy’s homeland.”¹⁷ Additionally, a need arose to protect these assets from other aircraft and maintaining *air superiority*. While not directly applicable to close air support, the philosophy is important to understand since it brought about a shift in focus on specifically developing and procuring aircraft capable of these missions. In 1937, the USAAC

... conducted some dive-bombing experiments with pursuit airplanes in recent years, but has never evolved any tactics for the employment of dive bombers as a class. At present there are no airplanes within the army air forces capable of being used as dive bombers.¹⁸

Leading into World War II, philosophies among the USAAC and the U.S. Navy and Marine Corps aviators differed drastically and would affect future roles and missions, as well as aircraft technology development.

World War II

Airpower as a whole during World War II offered greater opportunities for air superiority and strategic bombing missions. Close air support, however, continued to evolve and validated its importance as new technology and tactics were being applied. Opinions continued to surge

over developing multi-role aircraft versus procuring special-purpose aircraft capable of ground attack roles alone. Both the Germans on the Eastern Front and U.S. Marines in the Southwest Pacific incorporated methods of command and control for air-to-ground operations in CAS missions. Doctrine and Standard Operating Procedures (SOPs) were also drafted across the spectrum of services on Close Air Support.

Germany's thrust into Poland in 1939 and throughout the Eastern Front used an extensive amount of Close Air Support, allowing them to solidify their tactics. With local air superiority, they were very successful at integrating CAS using the *Schwerpunkt* concept, which directed all aircraft to commit to "force a decision at a vital point" during battle.¹⁹ Meanwhile, Generalmajor von Richthofen instituted organizational changes by placing air-ground control teams at the corps and division level to aid ground commanders in quickly implementing air support at precise times.²⁰ The Luftwaffe capitalized on the combination of a superb dive-bombing aircraft in the Ju 87 Stuka and modernization of radio communication.²¹ The Germans use of airpower during the Blitzkrieg war was impressive and it demonstrated "its synergistic blending of firepower on the battlefield".²² Stuka losses, however, were an awakening to the continuing need for air superiority in an age where the enemy was also airworthy and used multi-role aircraft.²³

U.S. airpower in World War II had unique characteristics in operations on the European Theater of Operations (ETO) as compared to the Pacific Theater of Operations (PTO). While there were some successes, the USAAF experienced an innumerable amount of difficulties in applying close air support in the ETO largely due to doctrine that was not followed in the Field Manual 31-35 and a growing lack of devotion to its futility. FM 31-35 established "air support commands" to work with ground forces, and unlike the Luftwaffe, the processes for coordinating

air support were slow and cumbersome.²⁴ Without effective means of communicating with the aircraft at the front-line level, "ground commanders saw the air support to them as being too fragmentary, sporadic, and sparse to be much good."²⁵ Conversely, in the PTO, the U.S. Marine Corps, along with Navy and AAF pilots, did not abide by FM 31-35. They adopted their own SOPs, and experienced tremendous successes in employing close air support. While quickly applying and building upon their CAS skills from the wars in the "Banana Republic", the Marines also trained and equipped Forward Air Controllers (FACs) with radios capable of talking to *all* pilots, including those from the AAF's 67th Fighter Squadron.²⁶ Close Air Support along the atolls was very triumphant. "In the ten close air support strikes conducted during the Bougainville landing, none of which was further than 500 yards... Marine support aircraft decimated Japanese defenders."²⁷

During the battle of Kasserine in North Africa, General Eisenhower was not pleased with the integration of air support among the Army, noting it as a result of poor training as troops were taught to instinctively fire back at attacking aircraft. Blame was directed at FM 31-35 and a new manual was then drafted for *all* air force-Army ground force relations in FM 100-20, Command and Employment of Air Power.²⁸ The USAAF, in essence, had drafted its "declaration of independence" from the Army by writing this manual.²⁹ It seemingly only paid lip service to the role of Close Air Support but stated in bold letters, "LAND POWER AND AIR POWER ARE CO-EQUAL AND INTERDEPENDENT FORCES; NEITHER IS AN AUXILIARY OF THE OTHER."³⁰ Additional issues of contentiousness were noted when this manual was adopted by the War Department without consulting the commander of Army Ground Forces. It detailed the philosophy of a growing air force by noting priorities of air-superiority, interdiction / deep strike, and direct battlefield support of the army as its last priority. FM 100-

20 reflected not only doctrine, but also a notion of an “innate unwillingness of the AAF to be diverted from its strategic air war objectives to come to the assistance of the ground forces.”³¹

This notion was a growing wave of philosophy about CAS among many professionals in the USAAF. Unfortunately, it would follow them into the Korean War while leaving a bad taste for the Army to deal with.

Korean War

The conclusion of World War II forced a movement towards downsizing and reconstituting within the Department of Defense. This four to six year period also brought about tremendous change for U.S. services, policies and their interrelationships, doctrine affecting priorities of airpower, and technological advances. All of these would have a direct affect on Close Air Support for the next decade into the Korean War and into the Vietnam War.

The National Security Act (NSA) of 1947 provided the U.S. Air Force its independence from the Army. This separation would prove to be as complicated as attempting to surgically separate a pair of Siamese twins in their teenage years. The Air Force’s focus was undoubtedly strategic and aimed at air superiority while the Army’s concerns grew over sufficient support for CAS. In accordance with the NSA of 1947, the Navy and Marine Corps “were permitted to retain their aviation assets while Army was permitted to retain ‘such aviation...as may be organic therein’.”³² This battle on what would be considered “organic” with specific restrictions set on Army aviation would be ongoing for years and well into the Vietnam War. To compound matters further, Executive Order 9877 was issued to clarify responsibilities of the growing Naval Aviation fleet of carrier aircraft. Following a Joint conference, The Key West Agreement of 1948 provided further and amplified definitions of air support as encompassing reconnaissance, logistical and close air support.³³ It also concluded a unified definition of Close Air Support as

“the attack by aircraft of hostile ground or naval targets which are so close to friendly forces as to require detailed integration of each air mission with the fire and movement of those forces.”³⁴

An extensive effort to establish a joint doctrine on airpower was being driven by the Air Force. The foundation continued to be FM 100-20 and some FM 31-35, both of which delineated a strong position on the importance of air superiority while leaving CAS as a follow-on effort. This evolved into a much broader doctrine in 1950 as the Joint Training Directive for Air-Ground Operations (JTD) but was not accepted by either service as policy.³⁵ The JTD attempted to take a centralized control approach to processing air requests and sending it down to the regimental level. In contrast, the Navy and Marine Corps “system for both air requests and air direction stressed rapid response and decentralized management of close air-support sorties.”³⁶ Additionally, philosophy of efficient use of airpower in CAS differed between the Air Force and the Marine Corps. The Air Force preferred alert aircraft to be called in to support ground forces whereas the Marines enjoyed the successes of continued airborne coverage and used on-call missions. Close air support was much more effective and responded quicker in the Marines’ method. This readily appealed to the Army and arguments were made for “each U.S. corps in Korea to have operational control of one Marine fighter-bomber squadron.”³⁷ For these Army Generals advocating improvements in CAS, a change would need to occur to the current doctrine.

Entry in the Korean War brought the era of the jet propelled and rotary wing aircraft. Airpower experts would be looking to adapt new tactics, and strategic philosophy in later years, with the introduction of this new technology. The Air Force had been interested in acquiring the newest multi-role jet fighter-bombers but the Army remained concerned with their focus and towards an effective CAS platform.³⁸ Problems noted in supporting the Army ground troops

with the new jet age was its poor fuel economy affecting range and time on station. Also, jets demonstrated inadequate target acquisition capability and accuracy since pilots were forced to fly at higher altitudes and use faster bombing speeds due to aircraft handling characteristics.³⁹ The Army expressed concern that its cost effectiveness would lead "to a reduction in the overall number of aircraft available for tactical air support duties."⁴⁰ Rotary wing aircraft were being adapted to new missions. Primarily they would serve in logistical, medical evacuation, and troop transport throughout the Korean War. Even though the Marine Corps was the "first to produce systematic doctrine for the employment" of helicopters, the Army's interest in procuring ground attack helicopters in Vietnam would be, yet again, another contentious issue with the Air Force and the mission of Close Air Support.⁴¹

Vietnam War

*Interservice rivalry over airpower issues during the Vietnam period occurred largely because each service genuinely believed that the independent development of doctrine and equipment that suited its own immediate concerns was the best way to serve the interests of the United States.*⁴²

Close air support was used a lot during the Vietnam War but produced only a few innovative applications at the tactical level. In contrast, interpretations on the strategic implications over airpower flared the ever-present clashes between the services and directly affected the employment of CAS. The conflict between the Air Force and Army over CAS was carried over from the Korean War, but with an increased emphasis on the Communist threat in the Soviet Union and the age of nuclear weaponry. As a result, aircraft development and modifications by the Air Force toward the CAS role were dramatically affected. In fact Chief of Staff General McConnell in 1968 stated: "We [USAF] did not even start doing anything about tactical aviation until about 1961 or 1962."⁴³ The outcome of a Congressional inquiry published in 1966 on Close Air Support in Vietnam brought attention to how the Air Force had been ill

prepared to support the Army in CAS noting how the Air Force was forced to "borrow" aircraft such as the L-19 and A-1 from the Army and Navy.⁴⁴ Aside from procuring the OV-10 from the Marine Corps, the Air Force managed to adapt training aircraft such as the F-5 and A-37 for CAS. Additionally, and although a bit late, in 1968 they initiated programs for the AC-130 "Spectre" and, in the future, the A-10, both of which are still in service today as primary CAS platforms.⁴⁵

A facet of close air support the Air Force did not fail to overlook was how it would "control" *all* theater aircraft. By implementing the Tactical Air Control System (TACS) seeking a "single management" concept, Air Force leadership "was to make repeated requests that the TACS become the sole management agency for all air assets in South Vietnam, regardless of their service or origin."⁴⁶ As one official put it, however, there is a discernable difference between *allocation* and *control* of aviation.⁴⁷ In theory, the TACS should have worked but the Army was not satisfied by Air Force CAS support because of excessive delays in response times and insufficient sorties allocated.

These discussions drew sharp criticism amongst the two services. First from the Army with "The Requirement for Air Fighting Units" document drafted by General Howze in 1960. At the time, the Army had already begun a large procurement process of both fixed wing and rotary wing aircraft that would be capable of fire support. Under the Air Mobility mission, the Army argued it brought about increased needs for close air support and it would seek to fill this void by using its own "organic helicopter gunships and fixed-wing AV-1 Mohawk close air support aircraft."⁴⁸ In a retaliatory manner, the Air Force rebutted the claims by the Army under the Disosway Report. Their less than subtle point was in control of all air assets, fearing that if the Army retained all of these aircraft "it would soon metamorphose into another centrally controlled

“air force” in direct competition with the USAF.”⁴⁹ The effects of these arguments continued for years until 1966 when Army Chief of Staff, General Johnson, and Air Force General McConnell resolved them through a closed-door compromise.⁵⁰ In essence, against the advice of several service advisors and even Secretary of Defense McNamara, General Johnson forfeited the Army’s fleet of CV-2 and CV-7 fixed wing aircraft in exchange for the Air Force abstaining from claims to helicopter operations in “fire support and supply of Army forces roles.”⁵¹ Furthermore, under this agreement the concept of Army rotary wing fires would be considered “Close Fire Support” CFS and no longer be considered “Close Air Support,” as that was seen as a fixed wing mission only by the Air Force.⁵² This is a notable difference since the U.S. Marine Corps fully believes in integrating rotary wing fires is a key component to its combined arms CAS support.

Operation Desert Storm

During Ronald Reagan’s presidency in the 1980’s, the services enjoyed a tremendous build-up in military equipment. Along with that came a surge for unified effort in planning and doctrinal comprise within DoD. The Defense Reorganization or “Goldwater-Nichols” Act of 1986 emphasized the need for unified commands and to recognize that each services purpose was to support that command.⁵³ The position of the Joint Forces Air Component Commander (JFACC) finally empowered the Air Force during Desert Storm to control all air assets in theater and “integrate the air effort.”⁵⁴

*As the Marines saw it, they had responsibility for a specified area in the vicinity of their ground forces. Within that area it was the commander of the MAGTF, not JFACC, who determined missions and priorities.*⁵⁵

Undoubtedly, the five-week air campaign for Desert Storm was planned and executed in an impressive manner. The phases for this air campaign were textbook from Air Force doctrine

with air superiority and interdiction as the leading efforts, followed by ground support in the form of CAS. As history has shown, the Marine Corps' focus was on providing CAS within the Marine Air Ground Task Force (MAGTF) and concerns were expressed as to how this would affect the new Joint construct. The JFACC and the Marine Corps agreed on a new settlement in the 1986 Omnibus Agreement. Essentially it stated that Marine Corps aviation would support the MAGTF commander first and then provides excess sortie support to the JFACC.⁵⁶

Advances in aircraft and weaponry with the only stealth aircraft, enhanced battlefield surveillance systems, and PGMs were important during Desert Storm. A tremendous link the Air Force brought to theater, however, was its theater air-to-air refueling capability. During previous conflicts, there was some limited tactical refueling capability. For CAS missions, time on station played a critical factor in the quality of support to the ground troops and it was very challenging to do without this strategic tanking support. The Marine Corps' AV-8B Harrier's capabilities allowed it to use smaller expeditionary style airfields to increase sortie rates to compensate for reduced time on station, and were very successful at it.

Air Force strategic refueling support and operational architecture for aviation support are seen as critical links and they remain so today.

Summary of the History of CAS

Close air support was among the first roles for the airplane in World War I and this role continues to be very relevant to this day. Although paths for how to use airpower diverged among the armed services, Close Air Support has always been the primary focus for the U.S. Marine Corps. Ever since the Air Force separated from the Army in 1947, its focus has increasingly become more strategic in nature. The Army, however, has been critical of the lack of support it received from the Air Force. To compensate, the Army focused more closely on

their massive indirect fire and armor capability supplemented with rotary wing “close fire support”. The Navy has a rich heritage in aviation and has attempted to support the Marine Corps in CAS during amphibious operations. World War II brought an awakening that the aircraft carriers were vulnerable to air strikes and thus they began to focus more towards the air superiority role. During the late 1980’s, the Navy and its carrier aviation “turned to short-duration contingency operations (CONOPS)” and “saw itself as a full-service contingency force.”⁵⁷ One fact that has become more apparent is in utilizing CAS as an integrated part of combined arms amplifies its potent power dramatically.

Current Views on JCAS

Technological Advances and Defining the Modern Battlefield

Advances in technology have not only affected airpower but have enhanced the fighting capability of our ground forces and their ability to maneuver. Equipment such as the Armored Personnel Carrier (APC) and the M1A1 tank give the traditional foot soldier the means to travel further, faster and with more lethality than ever before. The Unmanned Aerial Vehicle (UAV) and improvements in the reliability of satellite and secure radio communication have allowed the ground commander to exercise decentralized control with smaller unit sizes, offering him timely intelligence updates and reducing risk by providing a means to call for fire support if necessary. All of these capabilities are not independent of one another and their synergistic means lead to an increased need for combined arms using Close Air Support.

Following the “Goldwater-Nichols” Act of 1986 and reviewing lessons learned since Desert Storm, and more recently Operation Iraqi Freedom, the future of warfare will undoubtedly be a “Joint” effort and using equipment acquired through “Joint” means. Systems enhancements in Global Positioning Systems (GPS) have been utilized for navigation and for

precision targeting. PGMs are no longer restricted to service specific aircraft capable of releasing them, but can be used across the many aircraft in the fleet. Also, the future of relayed targeting information from a remote operations center providing hostile confirmation via data link will soon be commonplace. All of these capabilities, along with the future F-35 Lightning II, also known as the Joint Strike Fighter (JSF), will provide a quicker, more reliable, and more precise method of implementing *Joint Close Air Support* in the future.

Joint Close Air Support Explained

To fully grasp the core of this discussion, a definition of CAS and an explanation of its execution and vulnerabilities are needed. Assuming the need for close air support originates from the ground forces, the request for aircraft must follow a conduit that eventually gets the aircraft to confirm the target with the ground forces and prosecute it. Though there are several factors involved, for simplicity of explanation, the traditionally accepted conduit has been the link between the FAC/JTAC and the aircrew. Note that while discussing the basic tenets and their functional vulnerabilities, future technological advances will aid in streamlining this process; however, they will incur risks to similar vulnerabilities.

The definition of Close Air Support adopted in 1948 has been argued repeatedly as the services diverged on the subject during the Korean and Vietnam conflicts. More recently, the difficulty has been in attaining a consensus on the definition to adopt into Joint doctrine. The current definition in the JTTP 3-09.3 is:

*...air action by fixed-and rotary-wing aircraft against hostile targets that are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces.*⁵⁸

Assuming this definition is included in the JTTP for CAS *does not* mean it can automatically be used as a common baseline on the battlefield. Problems can quickly arise on a Joint battlefield if

someone doesn't know the history, or worse, fails to read further into other sections where it explains how services interpret CAS differently. The main argument from the Army, and lesser from the Air Force, has been on the use of rotary wing aircraft in a CAS role. The background has been revealed as how this was a result of the Johnson-McConnell Act and the Air Force attempting to cease control of the Army's fixed wing aircraft, and follow-on ideologies that have evolved from this agreement. The Army approaches rotary wing employment quite differently from the Marine Corps. In Afghanistan, rather than establishing hasty Battle Positions (BPs), Army Apaches would loiter directly over the ground Marines making themselves vulnerable, and unknowingly, blocking a potential avenue of fire by another friendly aircraft. As the JTTP notes, the "Army does not consider its attack helicopters a CAS system, although they can conduct attacks employing CAS JTTP when operating in support of other forces."⁵⁹ Their desire to support was more than welcomed, but to the FACs and other Marine air assets working the target area, their manner of employing fires was unorthodox, creating unnecessary friction and delays.

The JTAC is a term adopted by the JCAS manual as a parallel to the better-known Military Occupational Specialty (MOS) of a FAC. There is no longer a separate definition of a FAC included in the JTTP for CAS manual. For further information, a Memorandum of Agreement (MOA) was signed by all services to resolve the differences among the titles and establish a common baseline of Mission Essential Task Lists (METLs) to train to. A JTAC is defined as "a qualified (certified) service member who, from a forward position, directs the action of combat aircraft engaged in CAS and other air operations."⁶⁰ The technical knowledge and proficiency within these individuals is the backbone of the CAS mission and its ability to be effective. It is certainly situation dependent, but by enlarge if this individual is not prepared or is poorly trained, they will stagger through the process while dragging everyone else to suffer

through the consequences. If the FAC/JTAC is not either fully trained, qualified, or proficient, the mission could be jeopardized in the following areas:

*airspace coordination, aviation ordnance, fixed-and rotary-wing tactics, attack geometry and parameters, aircraft capabilities and equipment, ground-and airbased designator and spot capability, target acquisition equipment and utilization, communications equipment and procedures, briefing and debriefing requirements, suppression of enemy air defense requirements for each type of threat and the associated tactics and, most importantly, a general understanding of what the CAS aircrew is seeing and doing during different phases of the mission in order to effectively locate and destroy the target in a timely manner that does not expose friendly forces to undue risk.*⁶¹

The methods used to employ Close Air Support have been made more adaptive to technological advances of GPS and standoff weapons. The types of terminal attack control for CAS allow PGM profiles and no longer obligate the aircrew to perform dive-bombing ordnance deliveries and can be categorized as one or a combination of the following⁶²

- Type 1 – *JTACs use Type 1 control when the risk assessment requires them to visually acquire the attacking aircraft and the target under attack.*
- Type 2 – *Type 2 control will be used when the JTAC desires control of individual attacks but assesses that either visual acquisition of the attacking aircraft or target at weapons release is not possible or when attacking aircraft are not in a position to acquire the mark/target prior to weapons release/launch.*
- Type 3 – *Type 3 control may be used when the tactical risk assessment indicates that CAS attack imposes low risk of fratricide.*

The decision to use one type over another or a combination is situation dependent and based on the experience and proficiency of the JTAC to manage them. In general, Types two and three CAS accommodate technologically advanced systems and the use of standoff weapons to allow the aircraft to stay at a higher altitude to release while not sacrificing accuracy. These applications are vulnerable to systems manipulation and human error. An example of this type of error occurred in December 2001 when a B-52 crew made a regretful error by inputting the incorrect GPS position into their system and released a 2,000 lb Joint Direct Attack Munitions (JDAM) weapon 100 meters from a friendly position.⁶³ Since then, the JTTP for CAS manual

has mandated reading back the target elevation, target location, and restrictions given to the aircrew.

Type one CAS, on the other hand, requires the FAC/JTAC to visually acquire the aircraft and confirm the nose is pointed towards the target and not the friendly position prior to giving the aircrew a "cleared hot" to release. This type of control demands a high level of training and proficiency since it often comes down to a fraction of a second for the FAC/JTAC to determine these parameters. Furthermore, for the aircrew it also increases the level of difficulty and anxiety since the pilots must orient their aircraft precisely along the heading given, acquire the target, and patiently wait for clearance to fire while flying at over 500 knots towards the ground.

With the complexities involved with Type one CAS, amplified by improvements in technology allowing the use of Type two and three CAS, why then would there be a need to use Type one CAS? Examples provided in the JTTP for CAS manual are: "language barriers when controlling coalition aircraft, lack of confidence in a particular platform, ability to operate in adverse weather, aircrew capability, or troops in contact situations."⁶⁴ Additional factors to consider are a lack of precision targeting methods, CAS in an urban environment, moving targets, and employment in mountainous terrain. If a GPS target locating system is not available to provide a precise coordinate to the aircrew, the crew will be forced to visually acquire and aim at the target. Also, CAS in an urban environment, where using streets as avenues of fire and whereby if the directional angle of the ordnance being used is off by as little as one to two degrees, will risk fratricidal results. PGMs work very well against stationary targets but lack the ability for drastic correctional changes in flight should they be used on moving targets. Rotary wing assets have a variety of forward firing weapons that are better suited for these corrections; however, they still require the nose of the aircraft to be pointing in the general direction of the

target. Lastly, operating in mountainous terrain, such as in northeastern Afghanistan, poses a greater problem for fixed wing aircraft carrying electrical or mechanically fuzed bombs. The problem is in allowing enough time between release and impact for the bombs to fuze properly. Tactically, this could lead to a change in preferred ordnance to forward firing weapons such as guns and rockets, both of which require the aircraft to point its nose at the target, aim and shoot. Aside from being the "default" type of control, Type 1 CAS methods will be needed for a long time. It won't necessarily be dive-bombing related but the need to point the nose of the aircraft at the target that will drive the FAC/JTAC to prepare and train to be able to visually acquire the aircraft.

The common link between the FAC/JTAC and the aircrew is not simply training together but the need for a comprehensive doctrine on CAS. All FAC/JTACs are trained in a school environment, meanwhile aircrew spend time reading tactical manuals and doctrine to establish that common baseline of what is expected of them. This document must be thorough and well written for this reason.

JCAS Doctrine

JTTP 3-09.3 Deficiencies

The two noted areas of deficiency within the current JTTP for CAS manual is in defining who can control close air support, and that the document is too convoluted in terms of theory versus tactical application.

Prior to the turn of the century, there were indications within the Marine Corps that the service was at a low point for qualified FACs and could not readily afford to make more since aviator seats were also a priority. Therefore, they began to research the possibility of using personnel with ground MOS's to be trained and fill the void.⁶⁵ Moreover, when the services

compiled the first drafts of a Joint CAS publication, the MOS derived qualification of FAC was being used interchangeably by other services as a position held by someone who controls CAS. The difference is not small and is still confused today. The training requirements have been regulated much better by the MOA on JTACs but JTTP 3-09.3 does not distinguish the difference between what a FAC is versus a JTAC. This leads to additional confusion when discussing FAC Airborne usage or FAC(A) without attaching a similar JTAC(A). Does one qualification imply better training or enhanced qualification? The JTTP further muddies the water by adding:

In rare circumstances, the ground commander might require CAS when no JTAC is available. One reason for this would be as a result of some unforeseen consequence of combat operations. In these instances, JTACs, FAC(A)s, and/or CAS aircrews should attempt to assist these personnel/units to greatest extent possible to bring fires to bear in support of their combat operations.⁶⁶

Again, who is able to control CAS missions and how much training is required should be explained in this publication.

In the course of a single sortie, aircrew make thousands of decisions in their aircraft based on the rigid procedures they've applied through learned habits. Aircrew take a similar approach when learning about Close Air Support and the way the JTTP 3-09.3 is currently organized and worded, it detracts from learning sound procedures. There is too much strategic and operational theory intertwined in a publication slightly over 200 pages long and meant to span the gap across all services. From a tactical perspective, the planning and execution portions of this manual are vague and need considerable attention to limit any room for interpretation. Inside the front cover it reads: "The guidance in this publication is authoritative; as such, this doctrine (or JTTP) will be followed except when, in the judgment of the commander, exceptional circumstances dictate otherwise."⁶⁷ During OIF in Iraq and OEF in Afghanistan there were numerous incidents when

JTACs took the liberty of applying tactical adaptations that were not in the JTTP 3-09.3. The JTTP continues to stress the traditional nine-line format; however, it adds a separate method for calling AC-130 gunship CAS that is uniquely different. JTACs would routinely use this method of marking their *own* position with a GPS coordinate even when they were controlling non-AC-130 assets of other services. The dangers are clear and potentially fatal if the aircrew inadvertently released free-fall ordnance on the JTACs position. Hypothetically, what should the consequences, if any, be to those who fail to follow the JTTP 3-09.3 as authoritative and troops are killed because its procedures were not followed? Regrettably, this notion is a true possibility if JCAS procedures are not written more clearly, and perceptions changed so that they are followed more strictly.

Conclusion

Recent technological advances in aircraft capabilities, weapons systems and munitions have provided JTACs additional tools to maximize effects of fires while mitigating risk of fratricide when employing air power in close proximity to friendly forces. GPS-equipped aircraft and munitions, laser range finders/designators and digital system capabilities are technologies that can be exploited in CAS mission area.⁶⁸

The evolution of Close Air Support from World War I to OIF has been impressive. From a strategic and operational point of view, service culture has played a major role in dividing the emphasis on airpower between the Air Force and the Army over the path chosen by the Marine Corps and the Navy. The Air Force is the youngest of the services within DoD, but its heritage of dominating the skies through overwhelming airpower had been growing for decades. Its focus has always been on strategic employment of airpower while close air support has been a distant priority. The Marine Corps, on the other hand, understands Close Air Support is a tactical mission and has unequivocally adopted and perfected it.

The Goldwater-Nichols Act of 1986 forced DoD to resolve issues among the services by working together towards a common solution. Joint technological systems and aircraft have further united the armed services and individual needs for support are now seen as a common requirement. A Joint vision on Close Air Support is necessary and must be adopted as doctrine.

The following are additional proposals for the future JCAS doctrine:

- ❑ Common FAC/JTAC training must leave the form of a MOA and be included into a Section on Training. Standards for training JTACs should be referenced in this manual. Discussion about cross-service evaluation among JTAC producing schools should be included to avoid doubt that it is required.
- ❑ The term FAC should be accepted for all services. With the JTAC MOA aligning common training and qualification, the distinction previously needed between 'FAC' and 'JTAC' is no longer needed and adds to confusion.
- ❑ Alternatives to 'control points' should be addressed. The vastness of the modern battlespace complicates the ability to pre-SPIN (include as part of the Special Instructions) Initial / Control Points (IP / CPs) into the Airspace Control Order. This method should still be explained but the use of a telephone 'keypad' points should be taught as standard.
- ❑ The concept of 'Keyhole' CAS should be adopted as a technique for employing CAS in areas with undefined CPs.
- ❑ 9-line format should be readdressed. While there are a variety of ways to shorten this exchange of information with the aid of new technology, the various JTAC producing schools are better suited for a standard and adopting it for inclusion into JCAS doctrine.
- ❑ Under fratricide discussions, emphasis must be made to *rarely ever* include the GPS position of friendlies to the attacking aircraft.
- ❑ Consider the additional requirements to train to Type 1 CAS. As a future alternative and use of expanding technologies, incorporate simulation- training discussion into the JCAS doctrine under the Section on Training.

With the aid of technology, CAS employment during OIF/OEF was made more effective and in many ways, described as being easier. The threat environment and relatively flat terrain in Iraq have certainly facilitated the ease in which the coalition air was able to effectively employ CAS. The JTTP 3-09.3 held up to many circumstances and applications of technology. It is highly doubtful, however, that in its current rendition it could accommodate the rigorous challenges faced in the mountainous and urban terrain in Korea, where the threat of Surface to

Air Missiles is much more viable. Joint doctrine and training must align to meet these types of challenges by revising the current JTTP 3-09.3.

As the United States gears up for future conflicts, the future of Close Air Support holds many certainties: it will be a Joint effort, it will include advanced technological systems and aircraft, and the potential for fratricide will *never* go away. The mechanism that will facilitate the safe and effective employment of *Joint* Close Air Support is our current approach to training standards and the utility of a meaningful future JCAS doctrine.

Notes

- ¹ Carl Builder, *The Masks of War: American Military Styles in Strategy and Analysis: A RAND Corporation Research Study*. (Baltimore: The Johns Hopkins University Press, 1989), p. 4-5
- ² Ibid., p. 4
- ³ Richard Hallion, *STRIKE FROM THE SKY* (Washington, DC: Smithsonian, 1989), p. 20
- ⁴ Ibid., p. 20
- ⁵ Peter C. Smith, *Close Air Support: An Illustrated History, 1914 to the Present*. (Auckland: Orion Press, 1990), p. 11
- ⁶ Hallion, p. 21
- ⁷ Edward C. Johnson, *Marine Corps aviation: The early years, 1912-1940*. (Washington, D.C.: History And Museums Division, Headquarters, U.S. Marine Corps: 1977), p. 27
- ⁸ Peter C. Smith, *The History of Dive Bombing*. (Annapolis, Maryland: The Nautical & Aviation Publishing Company Of America, 1981), p. 13
- ⁹ Johnson, p. 12
- ¹⁰ Smith, p. 13
- ¹¹ Hallion, p. 53
- ¹² Smith, p. 29
- ¹³ Ibid., p. 29
- ¹⁴ Hallion, p. 21 and 51
- ¹⁵ Smith, p. 27
- ¹⁶ Hallion, p. 46
- ¹⁷ Ibid., p. 46
- ¹⁸ Smith, p. 27
- ¹⁹ Ibid., p. 49-50
- ²⁰ Hallion, p. 132
- ²¹ Ibid., p. 146
- ²² Ibid., p. 145
- ²³ Ibid., p. 146
- ²⁴ Ibid., p. 150, 163
- ²⁵ Ibid., p. 150
- ²⁶ Ibid., p. 165-167
- ²⁷ Ibid., p. 167
- ²⁸ Ibid., p. 172
- ²⁹ Ibid., p. 173
- ³⁰ Ibid., p. 173
- ³¹ Ibid., p. 174
- ³² Ian Horwood, *Interservice Rivalry and Airpower in the Vietnam War*. (Washington, DC: Dept. Of The Army, 2006), p. 15
- ³³ Ibid., p. 15
- ³⁴ Ibid., p. 12
- ³⁵ Benjamin Franklin Cooling, *Case Studies In The Development Of Close Air Support*. (Washington, DC: Office Of Air Force History, 1990), p. 349
- ³⁶ Ibid., p. 351
- ³⁷ Ibid., p. 382
- ³⁸ Horwood, p. 17
- ³⁹ Ibid., p. 17
- ⁴⁰ Ibid., p. 17
- ⁴¹ Ibid., p. 25
- ⁴² Ibid., p. 188-189
- ⁴³ Cooling, p. 411
- ⁴⁴ Robert E. Buhrow, *Close Air Support Requirements: A Study of Interservice Rivalry*. (Carlisle Barracks, PA: U.S. Army War College, 1971), p. 9
- ⁴⁵ Cooling, p. 445
- ⁴⁶ Horwood, p. 80

-
- ⁴⁷ Ibid., p. 83
- ⁴⁸ Ibid., p. 101
- ⁴⁹ Ibid., p. 47
- ⁵⁰ Ibid., p. 109
- ⁵¹ Ibid., p. 109
- ⁵² Ibid., p. 119
- ⁵³ Dana J. Johnson, and James A. Winnefeld. *Joint Air Operations: Pursuit of Unity in Command and Control, 1942-1991* (Annapolis, Md.: Us Naval Institute Press, 1993), p. 100
- ⁵⁴ Ibid., p. 99
- ⁵⁵ Ibid., p. 119
- ⁵⁶ Ibid., p. 101-119
- ⁵⁷ Ibid., p. 101
- ⁵⁸ *JTTP 3-09.3 Joint Tactics, Techniques, and Procedures for Close Air Support (CAS)*. (Washington, DC:Chairman, Joint Chiefs of Staff, Sept. 2003), p. ix
- ⁵⁹ Ibid., p. I-5
- ⁶⁰ Ibid., p. ix
- ⁶¹ Steve Wilson, <http://www.mca-marines.org/gazette/webarticle1dec06.asp> *Marine Corps Gazette* (accessed February 15, 2008), p. 3
- ⁶² *JTTP 3-09.3*, p. xiv
- ⁶³ Scott Jasper and Michael Binney, "Joint Close Air Support Training Transformation." *Marine Corps Gazette*, . (accessed January 10, 2008), p. 1
- ⁶⁴ *JTTP 3-09.3*, p. V-14
- ⁶⁵ Jeffery A. Smith, "Who can control a CAS mission?," *Marine Corps Gazette*, (accessed January 10, 2008), p. 1
- ⁶⁶ *JTTP 3-09.3*, p. I-2
- ⁶⁷ Ibid., p. i
- ⁶⁸ Ibid., p. V-14

Bibliography

- Warden, John A. *Air Campaign: Planning for Combat* Washington, D.C.: Potomac Books, 1989.
- Allison, Fred. "Marine Air Support." *Marine Corps Gazette*, . UNK (accessed January 10, 2008).
- Anonymous author, "Procedural CAS Training Done Dirt Cheap." *Marine Corps Gazette*, (accessed January 10, 2008).
- Arnold, Jeffrey. "Are You Using the Best Tools for Close Air Support?." *Marine Corps Gazette*, . (accessed January 10, 2008).
- Bell, Steven F.. *Close Air Support for the Future*. Fort Leavenworth, KS: U.S. Army Command and General Staff College, 1992.
- Brown, David. "JTAC: MOA vs JTTP | FA Journal | Find Articles at BNET.com." Find Articles at BNET.com | News Articles, Magazine Back Issues & Reference Articles on All Topics. http://findarticles.com/p/articles/mi_m0IAU/is_1_10/ai_n13717112 (accessed February 15, 2008).
- Buhrow, Robert E. *Close Air Support Requirements: A study of interservice rivalry*. Carlisle Barracks, PA: U.S. Army War College, 1971.
- Builder, Carl. *The Masks of War: American Military Styles in Strategy and Analysis*. Baltimore: The Johns Hopkins University Press, 1989.
- "CBC News Indepth: Friendly Fire." CBC.ca - Canadian News Sports Entertainment Kids Docs Radio TV. <http://www.cbc.ca/news/background/friendlyfire/> (accessed February 15, 2008).
- Christenson, Capt USMC. *The 9-Line Brief and Close Air Support*. Quantico: EWS, 2003.
- Coates, G.M.. *"Cleared Hot!" Skillsets: Standardization Requirements for Joint CAS Training*. Quantico, VA: EWS, 2003.
- Cooling, Benjamin Franklin. *Case Studies In The Development Of Close Air Support*. Washington, DC: Office Of Air Force History, 1990.
- Croizat, Victor J. *Close Air Support Procedures in the War Against Japan*. Santa Monica: Rand Corp, 1967.
- Ducar, Matthew, James B. Hunt, and James K. McBride. "Joint Aviation in Operation Enduring Freedom V." *Marine Corps Gazette*, (accessed January 10, 2008).

-
- Franzak, Michael V.. "Rethinking close air support terminal control procedures." *Marine Corps Gazette*, . Unk (accessed January 10, 2008).
- Grice, Michael D.. "Marine Corps Joint Terminal Attack Controllers." *Marine Corps Gazette*, . Unk (accessed January 10, 2008).
- Hallforth, David. "Digital Simulators." *Marine Corps Gazette*, . Unk (accessed January 10, 2008).
- Hallion, Richard. *STRIKE FROM THE SKY (Smithsonian History of Aviation and Spaceflight Series)*. Washington, DC: Smithsonian, 1989.
- Hawkins, Donald S.. "Close air support in the U.S. Marine Corps: A FAC's perspective." *Marine Corps Gazette*, . Unk (accessed January 10, 2008).
- Hoffpauir, Chris. "USJFCOM works to standardize joint close air support." USJFCOM. www.jfcom.mil/newslink/storyarchive/2005/pa080205.htm (accessed February 1, 2008).
- Horwood, Ian. *Interservice Rivalry and Airpower in the Vietnam War*. Washington, DC: Dept. Of The Army, 2006.
- Hughes, Nathan. "Holding the Ultimate High Ground." *Marine Corps Gazette*, . UNK (accessed January 10, 2008).
- Jasper, Scott, and Michael Binney. "Joint Close Air Support Training Transformation." *Marine Corps Gazette*, . Unk (accessed January 10, 2008).
- Johnson, Dana J., and James A. Winnefeld. *Joint Air Operations: Pursuit of Unity in Command and Control, 1942-1991 (A Rand Research Study)*. Annapolis, Md.: Us Naval Institute Press, 1993.
- Johnson, Edward C. *Marine Corps aviation: The early years, 1912-1940*. Washington, D.C.: History And Museums Division, Headquarters, U.S. Marine Corps : For Sale By The Supt. Of Docs., U.S. Govt. Print. Off, 1977.
- Keenan, John. "Editorial: Past, Present, and Future." *Marine Corps Gazette*, . Unk (accessed January 10, 2008).
- Leffler, Micahel. "Need CAS? Call 'Spooky': The role of the AC-130U gunship in CAS." *Marine Corps Gazette*, . UNK (accessed January 10, 2008).
- Mersky, Peter B.. *U.S. Marine Corps Aviation: 1912 To the Present*. Mt Pleasant: Nautical & Aviation Publishing Company Of Ame, 1983.
- Newton, Richard. "A Question of Doctrine?." *Airpower Journal* Unk (1988): Unk, Unk.

Roberts, L. Ross. "Scoring a CAS Touchdown." *Marine Corps Gazette*, . Unk (accessed January 10, 2008).

"Rotary Aircraft - Military Aircraft." Federation of American Scientists.
<http://www.fas.org/man/dod-101/sys/ac/rotary.htm> (accessed February 15, 2008).

Smith, Jeffery A.. "Who can control a CAS mission?." *Marine Corps Gazette*, . Unk (accessed January 10, 2008).

Smith, Peter C.. *Close Air Support An Illustrated History, 1914 to the Present*. Auckland: Orion Press, 1990.

Smith, Peter C.. *The History of Dive Bombing*. Annapolis, Maryland: Annapolis, Maryland: The Nautical & Aviation Publishing Company Of America, 1981, 1981.

Smullen, Robert J.. "Reinventing fixed-wing CAS." *Marine Corps Gazette*, . Unk (accessed January 10, 2008).

Wilson, Steve. "Marine Corps Gazette." Marine Corps Association. <http://www.mca-marines.org/gazette/webarticle1dec06.asp> (accessed February 15, 2008).

Joint publication system : joint doctrine and joint tactics, techniques, and procedures development program. Washington, DC: Office Of The Chairman, The Joint Chiefs Of Staff, 2000.

Joint Tactics, Techniques, and Procedures for Close Air Support (CAS) JTTP 3-09.3. Washington, DC: Chairman, Joint Chiefs of Staff, Sept. 2003.